Remainder Theorem

Similar to method of factor theorem, the difference being the value of $P(a)$.

If $(x-a)$ is a factor then $P(a) = 0$, but if $(x-a)$ is not a factor then $P(a) = R$

If we look at $P(x)$ - a polynomial in x & divide it by $(x-a)$ then we get

$$P(x) = (x-a)\underbrace{Q(x)}_{\text{quotient in } x} + \underbrace{R}_{\text{remainder}}$$

This works for all values of x so if $x = a$ then

$$P(a) = (a-a)\,Q(a) + R$$
$$P(a) = 0 \times Q(a) + R$$
$$P(a) = R$$

Compare it to factor theorem - no remainder for $(x-a)$ being a factor $(R=0)$ $\therefore P(a) = 0$

Try: Ex 7B Q1. $x^3 + x^2 - 2x + 3 \div x - 1$

if dividing by $x-1$ then try $P(1)$

$P(1) = 1^3 + 1^2 - 2\times 1 + 3 = 1 + 1 - 2 + 3 = 3$.

$\therefore$ remainder $= 3$.

	1	1	-2	3
$x-1$	0	-1	-2	0
	1	2	0	3

$$x^2 + 2x + \underbrace{\frac{3}{x-1}}_{\text{remainder}}$$